

Description

BATTERY SUPPORT STRUCTURE

BACKGROUND OF INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to vehicle front end battery support structures. More specifically, battery support structures constructed from a tubular material for supporting a battery within the engine compartment.

[0003] 2. Background Art

[0004] Light and medium duty vehicles powered by a combustion engine often use lead acid batteries to store energy for operating electrical accessories. The battery is usually carried in a receptacle or a tray located within the vehicle's engine compartment. In most light duty vehicles, the tray is supported by a sheet metal structure that is generally secured to the frame or body panel within the front end assembly.

[0005] Conventional front end assemblies are often made by stamping and welding together several individual frame

components. As each of the frame parts are attached to form subassemblies and then are attached to the body portion of the vehicle, it becomes more costly to assemble and increases the weight of the front end without enhancing the structure. The additional costs include plant assembly complexity and additional fasteners.

[0006] Hydroformed tubular elements are increasingly being used in the construction of vehicle front end structures. Hydroforming is a metal forming process that uses high pressure fluids to outwardly expand tubular blanks to conform with the surfaces of a die cavity of a die assembly to form a contoured hydroformed part. The walls of hydroformed members are uniformly work hardened and result in higher strength parts. Although a number of prior art inventions describe the use of tubular members in hybrid front end assemblies, few have taken full advantage of the opportunities available.

[0007] To ensure safe operation of the vehicle, the battery support structure is often large and of sufficient mass to create packaging challenges within engine compartment. In addition, medium and heavy duty vehicle applications often require a second battery and its corresponding sheet metal structure to meet the operating needs of the vehi-

cle. The additional weight associated with the battery support structure can exceed vehicle weight targets set for improving fuel economy in the light duty and medium duty truck segment. Therefore, there exists a need in the industry for a battery support structure that safely supports a battery, which minimizes its impact on packaging within the engine compartment, and adds minimal weight to the vehicle.

SUMMARY OF INVENTION

[0008] The present invention provides a vehicle support structure for storing engine compartment accessories. The vehicle support structure includes a first tubular frame member having a transversely extending portion and a longitudinally extending portion, a second tubular frame member disposed at least in part adjacent to the first tubular frame member and having a transversely extending base support portion that is spaced rearwardly from the transversely extending portion of the first tubular frame member, and an accessory tray secured to the first tubular frame member and to the base support portion of the second tubular frame member.

BRIEF DESCRIPTION OF DRAWINGS

- [0009] Figure 1 is a perspective view of a vehicle support structure for front end assembly with a battery tray positioned above its final location according to one embodiment of the present invention;
- [0010] Figure 2 is an exploded perspective view of the vehicle support structure and a battery tray; and
- [0011] Figure 3 is a perspective view of the vehicle support structure and battery tray.

DETAILED DESCRIPTION

- [0012] The present invention is a battery support structure for a front end assembly. The battery support structure may be used for to support the battery or another engine compartment accessory for any type of vehicle.
- [0013] Referring to Figure 1, a front end structure for a vehicle is generally identified by reference numeral 10. The front end structure 10 comprises a body portion 12 and a U-shaped tubular structure 14. The U-shaped tubular structure 14 comprises a left side tube structure 16, a right side tube structure 18 and a radiator tube support structure 20. Right and left side designations as used herein refer to the sides of the vehicle relative to the driver of the vehicle. The side tubes 16, 18 are mirror images of each other. Each side tube structure 16,18 extends in a longi-

tudinal direction generally in front of the body portion 12 to the radiator support structure 20. Each side tube structure 16,18 defines a battery support structure. The radiator support 20 generally extends transversely across the front of the vehicle and perpendicular to the longitudinal direction of the side tube structures 16 and 18. Each side tube structure is independently connected to the radiator tube 20 by a U-shaped bracket 22.

[0014] The left and right side tube structures each comprise an upper tube 24 and a lower tube 26. Each upper tube 24 comprises a body end 28, a first connecting point 30, a second connecting point 32, a battery support portion 34, an upper cooling portion 36, and a front end 38. The upper tube 24 has an inboard surface 40 and an outboard surface 42. The outboard surface 42 has a plurality of access holes 44 that provide clearance for front end assembly as well as performing securing operations. The upper tube 24 extends from a higher relative vertical position to a lower vertical position between the upper cooling portion 36 and the front end 38. The front end 38 is attached to the radiator support 20.

[0015] Each lower tube 26 of the left and right side tube structures, comprises a body end 46, a first connecting point

48, a second connecting point 50, a battery support portion 52, and a front end 54. Each lower tube 26 has an in-board surface 56 and an outboard surface 58. The lower tube has a plurality of access holes 60 that provide access for installation, welding, or other assembly operations associated with the assembly of the front end.

[0016] The lower tube 26 and the upper tube 24 are secured together to form each of the battery support structures 19. In Figure 1, a bottom surface 62 of the upper tube 24 and a top surface 64 of the lower tube 26 are secured to each other along with the upper second connecting point 32 and the lower connecting point 50 being disposed in close proximity to each other. Furthermore, an in-board surface 66 of the lower tube 26 and an outboard surface 42 of the upper tube 24 are secured together adjacent to the upper tube front end 38 and the lower tube front end 54, respectively. The upper tubes 24 and the lower tubes 26 extend longitudinally toward the front of the vehicle and are fixedly connected to each other prior to being attached to the radiator support tube 20. The upper tube 24 is formed to be inboard of the lower tube 26 such that the upper tube front end 38 is disposed in a vertical plane inboard of the upper body end 28. Similarly, the lower tube

front end 54 is located in a vertical plane more inboard than the lower tube body end 46. A battery tray 68 for supporting a battery 69, shown in phantom, directly above the upper battery support 34 and lower battery support 52.

[0017] Referring to Figure 2, one embodiment of the battery support structure 19 is shown. The battery tray 68 generally has a rectangular shape and includes a floor 86, a pair of opposing side walls 88 and 89 and a pair of opposing end walls 90 and 91. The side walls 88, 89 and the end walls 90, 91 project substantially in vertical planes. A portion of the side walls 88, 89 may extend beyond the end walls 90, 91 or the bottom 86 to form a side wall securing flange 92 and a lower support securing flange 94.

[0018] Referring to Figures 2 and 3, the battery tray 68 is shown in its final position. The lower battery support 52 supports the tray bottom 86. The upper and lower tubes 40, 56 have a plurality of securing holes 96. A plurality of bolts 98 extend through a plurality of clearance holes 100 located in the battery tray 68 and secure the battery tray firmly to the battery support portions 34 and 52.

[0019] While embodiments of the invention have been illustrated and described, it is not intended that these embodiments

illustrate and describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.